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The Development of Deductive Reasoning in Mastermind

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Abstract

We present an information-theoretic approach to modeling childrens performance in a deductive reasoning game. Our approach takes cognitive limitations into account to model the interpretability of feedback that children receive during the game. We use data of thousands of children, 5 to 12 years of age, from a popular online educational learning system. In the Deductive Mastermind game the player seeks to identify a hidden code that consists of a sequence of colors. The player sees a series of proposed codes together with corresponding feedback providing partial information about the similarity of each proposal and the hidden code. In Deductive Mastermind games, the proposals are set up such that deductive reasoning leads to a single possible hidden code. The games vary in code length, the number of possible colors, and the number of proposals, resulting in game difficulties of various degrees.